

**Amendment and Response**

Applicant: Raymond H. Kraft

Serial No.: 10/800,420

Filed: March 12, 2004

Docket No.: A126.253.102

Title: SYSTEM AND METHOD OF NON-LINEAR GRID FITTING AND COORDINATE SYSTEM MAPPING**REMARKS**

This is responsive to the Non-Final Office Action mailed June 25, 2010. In that Office Action, claims 8-15 and 21-28 were withdrawn and claims 1-7 and 16-20 were rejected.

With this Response, claims 1 and 16 have been amended, claims 21-28 have been cancelled and claims 29-39 were added. Claims 1-7, 16-20 and 29-39 remain pending in the application and are presented for reconsideration and allowance.

**Examiner Interview**

This communication further follows an interview between Examiner Lee and Chris McLaughlin on Wednesday, October 20. Examiner Lee mentioned that he would provide a substantive summary of the interview.

**35 U.S.C. §101 Rejections**

Claims 16-20 are rejected under 35 U.S.C. 101 as being drawn to non-statutory subject matter. As the data obtained by the claimed method is not intended to be transitory, the limitation "non-transitory" has been added to claim 16. On this basis, it is asserted that claims 16-20 satisfy the requirements of 35 USC 101.

**35 U.S.C. §112, Second Paragraph, Rejections**

Claims 1-7 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The issue with respect to these claims appears to stem from language of claim one alone, claims 2-7 being implicated solely because they depends from independent claim 1. Contrary to the assertion made by the examiner, line 7 of claim one is not limited to calculating a single absolute location. The calculation of an absolute location recited in line 7 of claim 1 refers to each of a number of "identified acquired image feature centers". Accordingly, it cannot be said that only "a single absolute location" is calculated and no confusion or indefinite language exists with respect to the numbers of absolute locations that are calculated and used for the claimed method. Line 7 of claim 1 has been amended to indicate that the calculating step is

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performed on "an absolute location for each identified acquired image feature center". As it is believed that claim 1 satisfies the requirements of 35 USC 112, second paragraph, it is submitted that claims 2-7 similarly satisfy the requirements of 35 USC 112, second paragraph.

**35 U.S.C. §102 Rejections**

Claims 1-2, 4 and 6 are rejected under 35 U.S.C. 102(b) as being anticipated by Michael et al., U.S. Patent No. 5,768,443 ("Michael"). It is submitted that Michael does not anticipate the above identified claims for at least the following reasons: Michael does not describe or suggest, explicitly or implicitly, that fiducial marks or features will be used, i.e. image, at all times and, Michael require the use of more than one imaging apparatus or camera.

Michael describes a calibration process whereby *multiple* cameras are calibrated, the one to the other, to ensure the proper orientation and positioning of the fields of view of the *multiple* cameras. At a minimum, Michael appears to teach that their system is only required where a user is faced with the task of accurately positioning multiple cameras, each having its own field of view. Accordingly, Michael fails to teach as claimed only a single imaging apparatus.

In particular, Michael explicitly states that the calibration target, which may include fiducial marks, is to be used only during a calibration phase. Their invention, which is a method of image correction, explicitly omits the use of a calibration target during run time. As such, no conversion from acquired coordinates to ideal fiducial coordinates is disclosed. Conversely, the present invention uses fiducial marks during run time to calculate an absolute location based on the conversion. For the foregoing reasons, it is submitted that claims 1-2, 4, and 6 are patentable over the Michael reference.

**35 U.S.C. §103 Rejections**

Claims 3 and 16-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Michael in view of Thompson, U.S. Patent No. 5,020,123 ("Thompson"). It is submitted that claims 3 and 16-19 are patentable over the combination of Michael et al. in view of Thompson

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for at least those reasons given above in the discussion of the examiner's rejections under 35 USC 102(b) above.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Michael in view of Macy et al., U.S. Patent No. 6,538,691 ("Macy"). Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Michael in view of Leonard et al., U.S. Patent No. 7,034,272 B1 ("Leonard"). Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Michael in view of Thompson in view of Macy. Claims 5, 7 and 20 are patentable for at least those reasons given above.

**New Claims**

New claims 29-39 include no new subject matter and are fully supported by the specification of the present application and are further believed to be allowable. As is mentioned in the background of the invention of the present application, in some instances the accuracy and precision required and metrology operation that uses imaging techniques to obtain object position exceeds the accuracy and position that can be provided using encoder positioning technology and standard, uncorrected images of the objects under test. The applicant does not contend that its methodologies represent a first instance or occurrence of the type of calibration that is described in the Michael et al. reference cited by the examiner. Rather, it is submitted that the applicant's invention, which is drawn to the use of fiducial marks that are included in each captured image to assist in locating objects in an image relative to the real world coordinate system defined by the fiducial marks that is both novel and nonobvious. In simple terms, the invention may be described as a method for correcting a captured image to remove optical distortion and other artifacts. However the context for this invention goes a bit beyond simple it image error correction in that the claimed image correction is done for the purpose of ensuring that when one identifies a position of an object in a captured image, that the correction factors obtained may be used to determine an actual location of the object in the coordinate system defined by the fiducial marks.

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A significant difference between the present invention and the identified prior art is that the array of fiducial marks used to back out optical error is present in every single image. Because the array of fiducial marks is included on a solid glass plate and because the array is etched in a known and highly accurate and precise manner, it is possible to more accurately determine the position of the object in the field of view in a reliable manner. As described in the background of the invention, in a standard metrology system that relies upon linear and/or rotary encoders the amount of error one may see in the position of an object in an image is approximately  $\frac{1}{2}$  the distance between each encoder position. For a calibrated system such as that described in Michael, et al., each image of an object will include this error. Conversely, because the present invention includes the calibration pattern (fiducial marks) in each image, a more accurate position may be directly determined. As such, new claims 29-36 are believed to be allowable.

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**CONCLUSION**

In view of the above, Applicant respectfully submits that pending claims 1-7, 16-20 and 29-39 are in form for allowance and are not taught or suggested by the cited references. Therefore, reconsideration and withdrawal of the rejections and allowance of claims 1-7, 16-20 and 29-39 is respectfully requested.

Applicants hereby authorize the Commissioner for Patents to charge Deposit Account No. 50-0471 in the amount of \$156.00 to cover the fees as set forth under 37 C.F.R. 1.16(h)(i).

Please consider this a Petition for Extension of Time for a sufficient number of months to enter these papers. At any time during the pendency of this application, please charge any additional fees or credit overpayment to Deposit Account No. 500471.

The Examiner is invited to contact the Applicant's representative at the below-listed telephone numbers to facilitate prosecution of this application.

Any inquiry regarding this Amendment and Response should be directed to Todd R. Fronck at Telephone No. (612) 767-2522, Facsimile No. (612) 573-2005. In addition, all correspondence should continue to be directed to the following address:

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Respectfully submitted,

Raymond H. Kraft,

By his attorneys,

Date: October 25, 2010

TRF:skh

/Todd R. Fronck/Todd R. Fronck  
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